15 de agosto
7 de enero
Años 22-23

Useche S. Fernanao

EMBRETIRE VILLA HEROJCA NO 1

Parroquia de Guatire, Zamora
Municipio de Miranda
de Venezuela

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AGRICULTURA APPLETREES

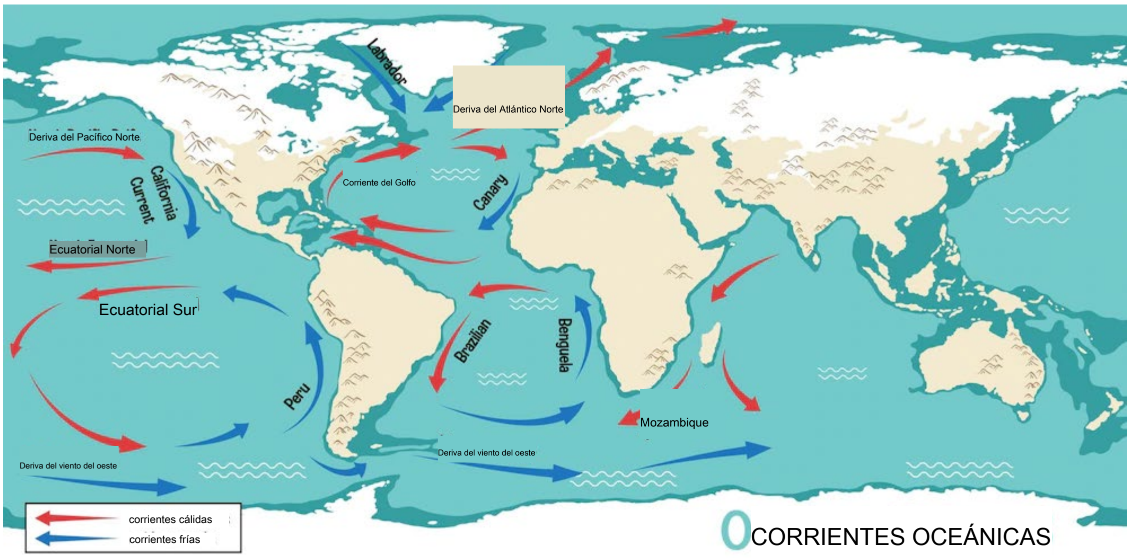
EN

VENEZUELA

Es un país con una situación privilegiada en la zona tropical, con tierras fértiles, ríos abundantes que permiten todo tipo de cultivos autóctonos y mundiales. Siempre se le ha llamado " Tierra de Gracia". Al tener Selvas, Llanuras Nevados, Desiertos, Playas, Ríos, Lagos y Lagunas, Sabanas, permite cultivos de todo el mundo, además de los nativos. Sería deseable que el Estado venezolano pusiera un mayor esfuerzo en la conservación y distribución de nuestras frutas, que con un buen enfoque lograrían su consumo masivo e incluso su posible exportación, evitando importaciones innecesarias.

PREFACIO

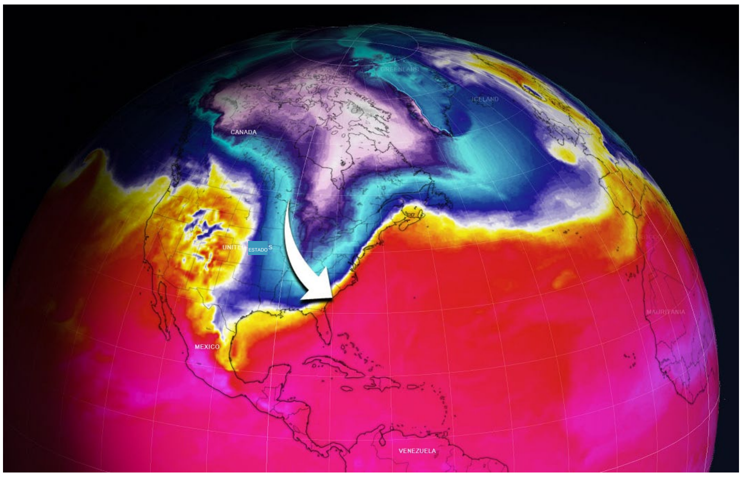
R Antes que nada quiero delimitar lo siguiente “Si nunca se intenta, nunca se consigue” en base a lo que les digo; Los manzanos son una especie de árbol híbrido que nos acompaña a los humanos desde hace aproximadamente 13.000 años, siendo uno de los cultivos más antiguos de la humanidad. Es necesario aclarar lo siguiente en Venezuela no hay muchos Manzanos existentes y los que sí existen, las familias generalmente los protegen como si fueran joyas, ya que persiste el Misticismo de que no se dan en zonas intermedias (entre 400/700msnm).). Debido a esta falta de conocimiento y confianza, no existen plantaciones gigantes en el país (ya que las zonas donde “si ocurren” son raras y necesitan mayor cuidado) . En el siguiente informe al estilo de Tesis les hago una síntesis. de cómo, cuándo, dónde y con qué inducir la floración, entre otros temas.



A antes de empezar; Hay que deshacernos del idealismo euroamericano, ya que el clima de Venezuela no funciona de esa manera. Venezuela tiene sólo 2 estaciones del año: Temporada de Lluvias, Temporada Seca " mal llamada en Venezuela como invierno o Primavera y Verano", es decir, al final de la temporada de lluvias y antes del inicio de la sequía (esto es en los meses de diciembre, enero y febrero) llega una microestación (Escalofrío Intenso al Amanecer) que dura sólo unas horas 09:00pm/08:00am cada día) y se llama coloquialmente "Pacheco", dependiendo de la altura sobre el nivel del mar que te encuentres. así, durará más y estará más frío o todo lo contrario.

Esta Microtemporada es causada principalmente por las corrientes oceánicas que traen consigo los icebergs antárticos que liberan su calor al descongelarse. (calor no significa caliente) retenido en su interior, asciende hacia las montañas en forma gaseosa pero no es capaz de condensarse para formar una nube y se mezcla con las partículas de agua líquida y desciende por toda la Cordillera en forma de Niebla, enfriándose y enfriando las zonas por las que pasa (estas nieblas pueden bajar las temperaturas hasta 10°C), algo similar ocurre en los Andes venezolanos.

Como ejemplo, cito el siguiente artículo de Venevisión Noticias, Canal de Noticias de Venezuela:



Ola de frío en Venezuela podría durar hasta febrero de 2023 según Inameh

"AHORA MISMO TENEMOS UNA MASA DE AIRE ENFRIADOR QUE SE ACERCA A NUESTRO CARIBE"

Una ola de frío encontrada en Venezuela podría durar hasta febrero de 2023, según el Instituto Nacional de Meteorología e Hidrología, Inameh.

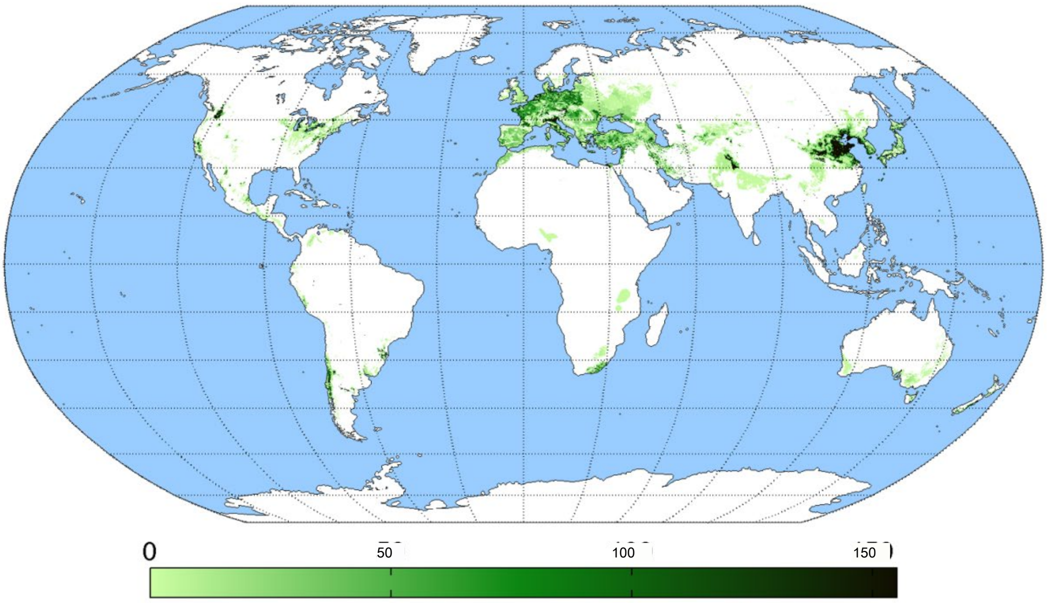
Diciembre suele ser una fecha donde se registran bajas temperaturas; sin embargo, cada día se reportan vientos helados con mayor intensidad. Según el gerente de meteorología del Inameh, Ángel Graterol, a estas horas una masa de aire helado cerca del Mar Caribe está provocando que tengamos un descenso notable de hasta 0 grados en las zonas más montañosas del país.

"Ahorita tenemos una masa de aire frío que se acerca a nuestro Caribe, así mismo noches bastante claras, lo que hace que la irradiación sea mayor y por eso tenemos temperaturas bajas a nivel nacional, aproximadamente la mínima de 7 grados estará oscilando hacia el región andina, 35 grados hacia los llanos centrales, mientras que la región capital tendrá una mínima de 17 grados y una máxima de aproximadamente 25 grados centígrados", explicó Graterol. Durante esta temporada de diciembre las temperaturas pueden bajar aún más en todo el país, por lo que recomendamos el uso de abrigos y ropa adecuada para evitar resfriados o alergias.

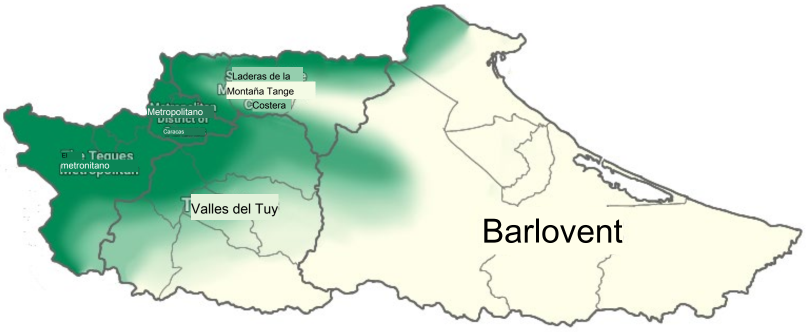
Sitio Experimental Provisional Mucuchies 3-8D: Está ubicado en el Municipio de Zamora, Ciudad de Guatire. el clima de la zona está en la intercesión de la

Climas “Templado Subhúmedo Cwb” & “Tropical de Sabana Awi” Tiene una temperatura promedio anual de 22°C en las horas más calurosas del día, no supera los 34°C y entre finales de noviembre y principios de En marzo la temperatura puede bajar más de alrededor de 12°C (sólo por la noche y como máximo por día reciben 4 horas a esa temperatura) La Humedad Promedio Anual es del 68%.

Sitio Experimental Quinta Maribel: Se encuentra ubicado en el Municipio Baruta, Parroquia Cafetal. La zona de la zona se encuentra en la intercesión de los climas "Templado Subhúmedo Cwb" y "Oceánico Cfbi" con una temperatura promedio anual de 19°C en las horas más calurosas del día 23°C (Entre diciembre y febrero la temperatura puede disminuir más alrededor de 9°C) La humedad promedio anual es del 80%.



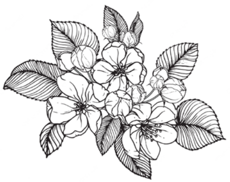
Producción regional promedio de manzanas (qha)



Estado Miranda con lugares potenciales Producciones de Manzanas

TEMPORADAS DEL AÑO EN VENEZUELA

Al estar en el trópico, Venezuela tiene un clima generalmente cálido y lluvioso, teniendo sólo dos estaciones: una estación seca, que va de octubre a marzo, y una estación lluviosa, de abril a septiembre. Pero debido a la orografía, los vientos y el mar, existen diferencias climáticas. La latitud tiene poca importancia, pero la altitud cambia drásticamente el clima, especialmente la temperatura, alcanzando valores muy diferentes. Al estar en los trópicos,



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Tipos de clima según

hacia Köppen

Este mapa localiza la ubicación de los climas representados en el mapa mental de la diapositiva anterior.

🟩 Selva monzónica

🟩 Bosque húmedo tropical

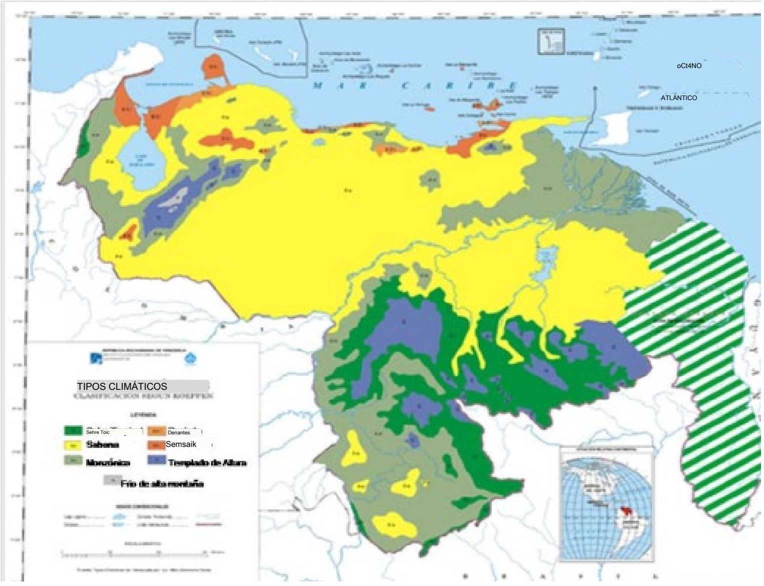
🟨 sabana tropical

🟧 Desierto

🟥 Semi árido

🟦 Templado Tropical De Montaña

■ Frío Montaña Tropical



*Los Climas Templado Montaña del “Período Seco” y “Húmedo” sus variaciones en Templado Montaña Tropical

Venezuela es uno de los 17 países megadiversos, con una geografía irregular que combina regiones áridas, selva, las extensas sabanas de los Llanos y ambientes andinos. Tiene las mayores reservas probadas de petróleo del mundo20, la novena en gas natural y la decimosexta en oro. Además, cuenta con el mayor conjunto de áreas protegidas de América Latina, denominadas Áreas Bajo Régimen de Administración Especial, las cuales cubren aproximadamente el 63% del territorio nacional (2007), siendo el porcentaje más alto de los países de las Américas.

La ubicación geográfica de Venezuela corresponde al hemisferio norte, y su límite sur está muy cerca de la línea del Ecuador terrestre. Su territorio continental está formado por una masa terrestre compacta que se extiende igualmente de este a oeste y de norte a sur. Su territorio insular comprende un conjunto de archipiélagos, islas e islotes en el Mar Caribe. Su geografía le confiere una gran diversidad de recursos naturales, principalmente energéticos y minerales, así como de especies y ecosistemas.

Venezuela tiene dos estaciones del año: primavera (temporada de lluvias) y verano (temporada seca).

Enero	Febrero	Marzo		Mayo	Junio
11°C/22°C	13°C/23°C	16°C/26°C	18°C/28°C	19°C/32°C 19°C/32°C 19°C/	
8°C/18°C	12°C/19°C	15°C/21°C	17°C/23°C	24°C 19°C/24°C	
julio	agosto	Septiembre	Octubre	Noviembre-Diciembre	
21°C/32°C	23°C/32°C	22°C/28°C	20°C/25°C	17°C/23°C 13°C/24°C	
17°C/24°C	18°C/25°C	16°C/24°C	15°C/20°C	13°C/17°C 10°C/14°C	

ciudad de guatire

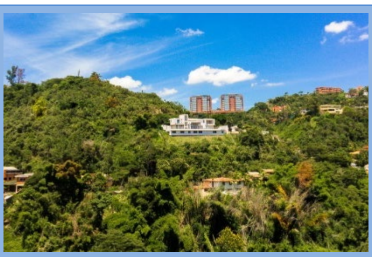
Bandera

Sello

Mapa

Clima	Sabana Tropical y Tropical Templada 11°C a 28°C
Altitud	480m.s.n.m.
Humedad Anual	68%
Infundado, primera referencia	1641
Área	214km²
Agricultura Calidad	Malo

Zona con riesgo en Clima Colateral



Parroquia Cafetal

Bandera

Sello

Mapa

Clima	Templado Tropical 10°C a 28°C
Altitud	980m.s.l.
Humedad Anual	80%
Fundado	19 de agosto de 1620
Área	25km²
Agricultura Calidad	Bien

REQUISITO DE ENFRIAMIENTO

También conocida como acumulación de frío, es un factor decisivo en la adaptación de estas especies a su entorno. De este requerimiento depende la interrupción del letargo de un amplio espectro de frutales y arbustos de uso comercial, como por ejemplo especies frutales de pepita (manzano, peral, membrillo), de hueso o de hueso (melocotón o durazno, ciruela japonesa, cerezo dulce, cerezo ácido). , Olivo, etc), las especies productoras de frutos secos (Almendra, Avellana, Nogal, Castaño, Pecana, Pistacho), las especies arbustivas de hoja caduca (Arándanos, Frambuesas, Moras, Mora, Grosella), y las especies trepadoras de hoja caduca (Vid, Actinidia) . Todos ellos tienen que ser expuestos a un período de bajas temperaturas durante el letargo invernal para una adecuada pausa del letargo y el inicio de la nueva temporada de crecimiento.

NECESIDAD DE ENFRIAMIENTO, EXPRESADA EN «HORAS DE ENFRIAMIENTO», PARA LA INTERRUPCIÓN DEL SUEÑO DE DISTINTAS ESPECIES DE FRUTAS DE CADUA

Metálico	Solicitud de Frío	Observaciones
Arbol de almendras	200-500	
Árbol de actinidia (kiwi)	700-1400	
Planta Arándano tipo lowbush' Planta	>800	
Arándano tipo 'highbush'	150-1000	
Planta Arándano tipo 'Ojo de Conejo'	300-600	
avellano	800-1600	
Árbol caqui	100-500	
Cerezo dulce	500-1300	
ciruelo europeo	700-1600	
ciruelo europeo	500-1000	existir variedades con requisitos solo 200 canales
árbol de albaricoquero	100-1100	
Melocotonero	200-500 600-1600	variedades más generalizado requiere 600-800 CH
Planta Tarta De	600-1600	
Frambuesa Cerezo	600-1500	
Árbol de manzana	200-2000	el general significar de los cultivares es 1200 CH
árbol de membrillo	50-500	
Nogal común	800-1500	Alguno las variedades californianas requieren 300 CH
árbol de nuez	100-600	
peral	620-1800	
plantar vid de uva	500-1400	existen variedades con requisitos solo 100 CH

Cuando las especies frutales de clima templado no se exponen a bajas temperaturas según sus necesidades específicas (en general, la máxima eficiencia está entre 2,5 y 9,1 °C), se observan un conjunto de síntomas, entre los que se encuentran los más comunes. el siguiente: Retrasar la Apertura de Yemas Vegetativas; Retraso en la apertura de los botones florales; Brotación irregular y dispersa; y Desprendimiento de Capullos Florales.

Como consecuencia, el La productividad de la especie está seriamente comprometida.

MODELO UTAH

Investigación en el Las exigencias de bajo temperatura para romper el letargo de las yemas de los árboles frutales comenzaron hace más de medio siglo. Weinberger (1950) acuñó la expresión "Horas de enfriamiento" (CH) para referirse a aquellas horas pasadas a temperaturas inferiores a 7 °C, y por primera vez correlacionó las CH con la cantidad de enfriamiento necesaria para romper la dormancia y el sueño. Crecimiento normal posterior de árboles frutales. De su trabajo surgió la expresión “Requerimiento de frío” para cada especie y variedad. Existen modelos muy variados que, con distintos grados de complejidad, buscan predecir la ruptura de la dormancia en función de la temperatura. El tema fue ampliamente discutido por Melgarejo y Viémont y Crabbé, entre otros.

Los primeros modelos consideraban que las temperaturas superiores a 7 °C no tienen efecto en la salida del reposo invernal, y que las inferiores a ese umbral tienen el mismo efecto.

Posteriormente surgieron otros modelos que contemplan rangos de temperatura con

diferente eficiencia en la acumulación de Chilling. Así, Richardson et al. (1974) propusieron el «modelo Utah» (ver Tabla 1), en el que a cada temperatura o intervalo de temperatura se le asigna un nivel de eficiencia para contribuir a romper la latencia.

Según este modelo, 1 CH equivale a 1 Unidad de enfriamiento (CU) sólo en el rango de temperatura entre 2,5 y 9,1 °C. Las temperaturas inferiores a 1,4 °C no son efectivas para romper la latencia y, por lo tanto, no tienen impacto en la acumulación de Enfriamiento.

Las temperaturas entre 1,5 y 2,4 °C, o entre 9,2 y 12,4 C, tienen una eficiencia del 50% y temperaturas iguales o superiores a 16 °C producen un efecto negativo, restando unidades de refrigeración de la suma diaria. Las CU diarias se obtienen sumando las CU de cada hora del día, por lo tanto, para utilizar este método se requieren datos de temperatura horaria. Una vez que se ha acumulado un nivel determinado de unidades de refrigeración, se requiere una cierta cantidad de unidades de calor para interrumpir el sueño.

Se completa con la exposición a temperaturas superiores a 4,5 °C (en inglés, grados hora de crecimiento o GDH). Las CU diarias se obtienen sumando las CU de cada hora del día, por lo tanto, para utilizar este método se requieren datos de temperatura horaria. Una vez que se ha acumulado un nivel determinado de unidades de refrigeración, se requiere una cierta cantidad de unidades de calor para interrumpir el sueño. Se completa con la exposición a temperaturas superiores a 4,5 °C (en inglés, grados hora de crecimiento o GDH). Las CU diarias se obtienen sumando las CU de cada hora del día, por lo tanto, para utilizar este método se requieren datos de temperatura horaria.

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Ratio de Eficiencia para salir de la Dormancia, Según el “Modelo de Utah”:

Temperatura en grados Celsius (°C)	CU correspondiente a 1 hora transcurrida en un rango determinado
<1,4	0
1,5 a 2,4	0,5
2,5 a 9,1	1
9,2 a 12,4	0,5
12,5 a 15,9	
16,0 a 18,0 >18	-0,5 -
	1

Se define como 1 unidad de Frío (UF) al aporte de Frío que hace transcurrir 1 hora en el intervalo térmico de 2,5 a 9,1 °C, para despertarse del sueño. El resto de intervalos térmicos presentan menores niveles de eficiencia.

Otros modelos más recientes consideran que existen cambios en la temperatura óptima de acumulación de frío durante el periodo de latencia, ya que se producen cambios en la sensibilidad al frío del frutal.

El "modelo Utah" no está adaptado a zonas con inviernos suaves, por lo que se han desarrollado modelos alternativos, basados en diferentes criterios en referencia a la eficiencia de acumulación de frío. Entre ellos destacan el "modelo de bajas necesidades" de Gilreath y Buchanan (1981), el "modelo de Carolina del Norte" de Shaltout y Unrath (1983) y el "modelo dinámico" de Erez y Couvillon (1987).

El "MODELO DINÁMICO» de Erez y Couvillon (1987) sugiere la presencia de dos etapas en la ruptura de la latencia, y se adaptaría mejor a localidades con inviernos menos uniformes que aquellas en las que se basó el «modelo Utah». El "modelo dinámico" " propone la existencia de un factor de ruptura de la latencia, de naturaleza estable, que está precedido por un precursor de naturaleza inestable. La temperatura podría afectar la acumulación del precursor inestable de varias maneras: podría inactivar la biosíntesis del precursor (al valores de 0 C o inferiores), estimular su biosíntesis (a 4-10 °C), o acelerar/estimular su degradación (a 14 °C o más).

Además, el modelo propone que, cuando el precursor se acumula más allá de un umbral de concentración determinado, se convierte en el factor de ruptura de la latencia estable y activo. Esta conversión es favorecida por períodos cortos de temperaturas moderadas (15 °C), que no son óptimas para la biosíntesis del precursor. Este criterio buscaría explicar por qué las temperaturas invernales superiores a los 15 °C, frecuentes en algunas zonas de producción de Prunoideas en Argentina como el NE de la Provincia de Buenos Aires y el S de la Provincia de Santa Fe, no siempre perjudican el descanso. del sueño.

La alternancia de periodos cortos de temperaturas relativamente altas podría ser útil para "estabilizar" el precursor que se sintetizó durante las horas previas a bajas temperaturas.

Así, temperaturas de 15 °C o superiores podrían ser más o menos favorables para romper la latencia, dependiendo de la etapa de la latencia en la que se produzcan y de su duración.
Esto no es óptimo para la biosíntesis del precursor.

Descansar a bajas temperaturas. Así, temperaturas de 15 °C o superiores podrían ser más o menos favorables para romper la latencia, dependiendo de la etapa de la latencia en la que se produzcan y de su duración. Este criterio buscaría explicar por qué las temperaturas invernales superiores a los 15 °C, frecuentes en algunas zonas de producción de

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En zonas con inviernos cálidos-templados, donde la acumulación de frío puede ser insuficiente en algunos años, se utiliza con éxito la disminución de la temperatura mediante la evaporación del agua, método conocido en inglés comocooling (por ejemplo, en Israel).
Con esta técnica se reduce la temperatura de los cogollos hasta 15 °C, mejorando la acumulación de frío y, en consecuencia, rompiendo el letargo.

El caqui es una especie que se adapta tanto a climas templados como subtropicales, y tiene bajos requerimientos de frío. En Australia se cultiva en zonas con menos de 100 CH mientras que en otras regiones del mundo se adapta a zonas con 800-1000 CH a menos de 7,2°C.

INDUCIR LA FRUITIZACIÓN

El Manzano en el Trópico no se puede plantar y esperar a que produzca, debemos aprender a conocer los factores agroclimáticos que nos permiten "manipular" la planta para inducirla a dar frutos. Hemos agrupado estos factores de la siguiente manera: conducción de las ramas vs poda; II riego versus sequía; II defoliación vs. inductores florales; Floración IV versus abejas y fertilización V versus ninguna fertilización. A partir de aquí, intentaremos explicar de forma breve y precisa qué entendemos por “Manipular” la planta, teniendo en cuenta estos cinco factores.

El manzano, en general, tiene tendencia a tener un mayor crecimiento vegetativo que fructífero. Esto sucede tanto en climas templados como en los trópicos. La diferencia es que el manzano en el trópico tiene una mayor cantidad de días con temperaturas favorables para su crecimiento. Sin embargo, esto se puede controlar mediante el entrenamiento de las ramas y la poda durante el proceso esquelético del árbol. Conducir las ramas o "aplastar" consiste en doblarlas en un ángulo de 45° para detener el crecimiento vegetativo. El ángulo de curvatura debe estar dentro de ciertos límites, para evitar la brotación excesiva de yemas vegetativas que se produce cuando el ángulo es superior a 60°.

Esto hay que combinarlo con una poda, que tampoco puede ser excesiva porque la planta reacciona emitiendo muchos brotes vegetativos. En ambos casos, un exceso de “aplastamiento” y poda hacen que el árbol no dé frutos o los dé muy raramente.

Todo este proceso debe gestionarse durante los primeros tres ciclos de crecimiento del árbol.

Cuando el árbol se ha formado con un buen esqueleto y está listo para soportar la producción comercial, se debe someter a un período de sequía o "castigo" para facilitar la defoliación. Este período seco puede variar de tres a seis semanas según la textura del suelo, ya sea franco arenoso y franco arcilloso respectivamente.

De esta forma conseguimos "engañar" al árbol, creando condiciones aparentemente similares a las que provoca el frío en países de clima templado. En nuestro país este "castigo" se aplica, por supuesto, durante la estación seca, coincidiendo con los meses de temperaturas mínimas: diciembre, enero y febrero.

Cuando los árboles presentan hojas amarillentas o quemadas por falta de agua, el siguiente paso es defoliarlos. Esto se puede hacer manualmente, pero comercialmente se elabora con un 8-10% de urea más un 0,25% de adherente, eliminando así las hojas.

Cuando finaliza el período de “castigo” y defoliación, se comienza a regar los árboles. Una semana después los cogollos empiezan a hincharse y en la semana siguiente se produce la floración. Existen algunos productos químicos como la Cianamida hidrogenada (Dormex) o el Dinitro-Ortho Cresol (Trifina), que mezclados con aceites minerales consiguen favorecer una mayor y más uniforme floración. Estos productos generalmente se aplican inmediatamente después de la defoliación de las plantas y al reiniciar el riego.

Una vez que los árboles han florecido, es importante la presencia de abejas que contribuyen a la polinización cruzada de las flores con el polinizador adecuado. Cuando se produce el "cuajado" de más del 50% de las flores, comienza la fecundación. Esto debe hacerse según el contenido de nutrientes del suelo y en el momento adecuado. Si se hace antes

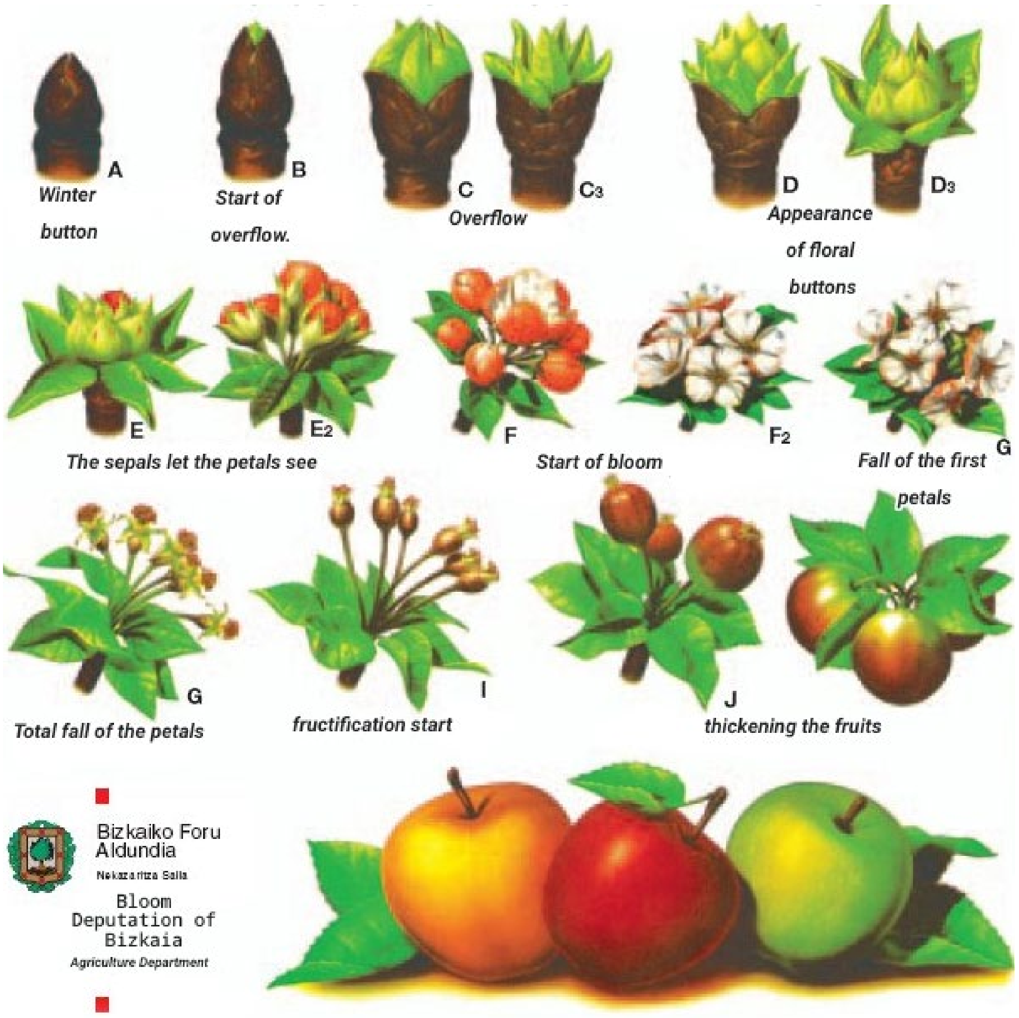
flowering, more vegetative growth is stimulated and flowering is reduced. The same happens when excessive amounts are applied. If we observe that the plantation has had excess vegetative growth in previous months, it is preferable not to fertilize.

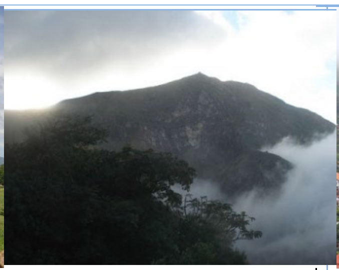
THE CHEMICAL ALTERNATIVES THREE BY THE START OF BLOOM

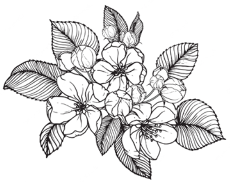
Artificial Chemical	Absorption Method	Effectiveness	Degree of Toxicity	Degree Contaminate	Prices
 ETHYLENE C_2H_4 (Hormone)	Injection	Nice	Bad	Less	15$
 UREA CH_4N_2O	Saturation in Soil	Bad	Bad	High	2-3$ (Kg)
 HYDROGEN CINAMIDE NH_2N_2	Foliate Spray	Nice	Nice	Less	10$
 DNOC (DINITRO-ORTHO-CRESOL) $CH_3C_6H_2(NO_2)_2OH$	Foliate Spray	Nice	Nice	High	35$

Exposure and adaptation to warmer climates in the early stages of the life cycle of the specimen increases the susceptibility of the apple tree to chilling.

PHENOLOGICAL STAGES OF APPLE TREES



Climate	 Savanna Tropical Awi Climate	 Subhumid Temperate Cwb Climate	 Oceanic Cfb Climate
Altitude	230-400masl	900-1000masl	900-2300masl
City with Climate	Flag Seal Guatire (Central Area of the City)	Flag Seal Caracas	Flag Seal Tovar Colony
Annual Rainfall Amount	750mm/900mm	900mm/1200mm	1300mm/1500mm
Temperature Average	24,6°C	19,9°C	16,8°c



Annual Humidity Annual Relative	68%	78%	94%

SENSITIVITY ACCORDING TO THE TYPE OF YOLK

One aspect to take into account when breaking dormancy is the type of buds on which the fruit plant bears fruit. Lack of cold and treatments to break dormancy cause flower buds to drop, while in those fruit species that has mixed buds, such as vines and actinidia, sensitivity is significantly lower

WHAT IS THE APPLE TREE?

The Apple Tree is a small tree of the Rosaceae Family (Malus x domestica). gives a Pomaceous fruit (there are more than 2000 specimens of Apple tree), it is native to the temperate zones of Eastern Europe (Anatolia) and Central Asia (Current Kazakhstan and China).

*The Apple may have been the first species cultivated by humans approximately 1,300 years after its domestication. It is Cultivated in the 7 Continents, Asia, Europe, Africa, Oceania (only in Australia and New Zealand), in North America and South America (including Mexico, Central America and the Caribbean Islands). This shows that it is a Crop of great commercial interest.

Description: Malus x Domestica belongs to the family Rosaceae, subfamily Pomoideas, genus Malus. This genus has a basic chromosome number equal to 17 (x=17); they are generally deciduous trees and shrubs; thorn less branches; buds ovoid with several imbricate scales; leaves simple or pinnate, serrate or lobed, with folded or convulsed stipules on the bud: flowers in corymbs, white to pink or crimson; petals sub orbicular

Taxonomy of Venezuelan Apples Tree

Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Rosidae
Order	Rosales
Family	Rosaceae
Subfamlily	Amygdaloideae
Tribe	Maleae
Gender	Malus
Specie	X domestica *Borkh. 1803*
*Hybrid Species: sown in Venezuela (rarely planted "Domestica" pure and when done, it is cross them with those that are already established and obtain more resistant hybrids, with a greater size of the fruit, among other characteristics).	*X pumila* or *X silvestri*

or obviate; stamens 15-50 with yellow anthers; styles 2-5 united at base; fruit is a pome without stony cells with persistent or deciduous calyx (Westwood 1982). It is grown mainly in areas with cold winters. At present, its cultivation areas have been extended to tropical regions.
The tree it can reach a maximum of 12 meters in height, naturally it has a globe-shaped crown, the normally straight trunk reaches 2/2.5 meters, its bark is smooth, reddish-ashy, greenish or grayish in color on its branches, and scaly and brownish gray on the old parts of the tree. They have an approximate life of 150/200 years (depending on various factors, between 5 and 15 years of age they may not be seen flowering) and if they are grafted 60-80 years (their productive life begins at 3-5 years and ends between 35-40 years). The branches grow from a fairly open angle on the dark green stem, sometimes tending towards blackish or purplish, and the young shoots end in a kind of thorn.

HISTORY OF APPLE TREES IN VENEZUELA

In Venezuela, when you wanted to plant temperate climate fruit trees like apple trees, you looked for the highest and coldest areas, under the assumption that they should be planted there, because these crops come from cold areas. For this reason, in the Venezuelan Andes, very old small plantations and collections of different species are found, scattered throughout the area, such as in Pueblo Hondo, Táchira state (2300masl) with these same criteria, a much larger apple plantation was planted in the Gloomy Prairie of Mariño, Mérida state (2610masl).

These areas, in addition to being cold almost all year round, have the disadvantage of having fewer daylight hours, due to the cloudiness that generally appears very early in the afternoon.

Therefore, the plantations must be given photoperiods, although in the same way their yield will be much lower In countries with a temperate climate (30°-50° latitude), where these fruit trees have traditionally been planted, temperatures during winter are very low (5-0°C and less), and the number of daylight hours is reduced. In this season the fruit trees lose, and completely throw away the leaves and the buds of the trees enter a period of "rest" or "Latency".

TABLE OF ADVANTAGES/DISADVANTAGES FROM THE CULTIVATION OF APPLE TREES IN VENEZUELA

Advantages	Disadvantages
A climate with almost constant temperatures throughout year	Higher Incidence of Pests
Earliest development in the floors	
Greater Quantity Hours of sunlight (with the exception of from 1000masl)	
Development in Alluvial Soils	root rot in little alluvial soils ventilated
Higher Humidity Index	
	Increased need for human control in plantations

In spring, when the temperature is around 18°C/ 20°C, the buds come out of that period of "Latency" and the flowering and fruit set occur.

In the summer the temperatures are high (25°C/40°C) and the days are long; due to the greater number of light hours, the development of the fruit occurs.

In autumn, temperatures begin to drop again, affecting the development of fruit quality factors, such as: color, total soluble solids, and acidity.

As can be seen, fruit trees in a temperate climate are not subjected to permanent cold, but two seasons with different temperatures and light that allow the development of the normal cycles of the trees. Hence, Dr. Gordon Edwards, from Australia, affirms that "temperate climate fruit trees that have been successful in the tropics are generally located at intermediate altitudes." Thus we have the Batu apple tree in Indonesia (800 - 1200masl), Baguio and Spencer Farm in the Philippines (520masl) among other examples such as the Peach in Tovar Colony, Venezuela (1200masl-1400masl). Although there are exceptions such as the case of the Grape in Maracaibo, Venezuela (40masl) and in Bangkok, Thailand (12masl).

In countries with a temperate climate, there is traditionally the concept that the species and varieties of fruit trees planted require a certain number of accumulated hours of cold between 5-7°C to break the "dormancy" of the buds and for it to occur the bloom. According to this, there are species and cultivars that have a low, medium and high “Chilling requirement".

Starting in 1982, interest began to renew in Venezuela for the planting of temperate climate fruit trees, and especially for the apple tree, due to the fact that the material known as 'VC -1' or ' Brown' became known, which flowered and produced well at elevations around 500masl. This stimulated the FRICA Company, which planted, starting in 1984, 10 hectares of apple trees in Miranda, Carabobo state (620masl). In addition, in the east of the country, in Caripe, it has had a good yield in the cultivation of peach and grape Monagas state (800masl/1000masl), some parts of the Andes, on a farm in Tabay, Mérida state (1500masl) the cultivar 'Anna' of Israeli origin with low "Chilling Requirement" began to be planted.

In 1985, the Second Meeting of the Working Group on Temperate Climate Fruit Trees in the Tropics and Subtropics was held in Venezuela, sponsored by the International Horticultural Society (Fruticulture), due to the interest that the country has had in the cultivation of peach and the grape. Previously, the National Federation of Fruit Growers had promoted the first meeting of researchers and producers of temperate climates.

All this set of stimuli has led to the planting of more than 30,000 apple plants in Venezuela. These, in a large proportion, have been planted in home gardens where there are 1 to 3 plants, but an important part are found in farms that have planted between 100 and 3,000 (plants).

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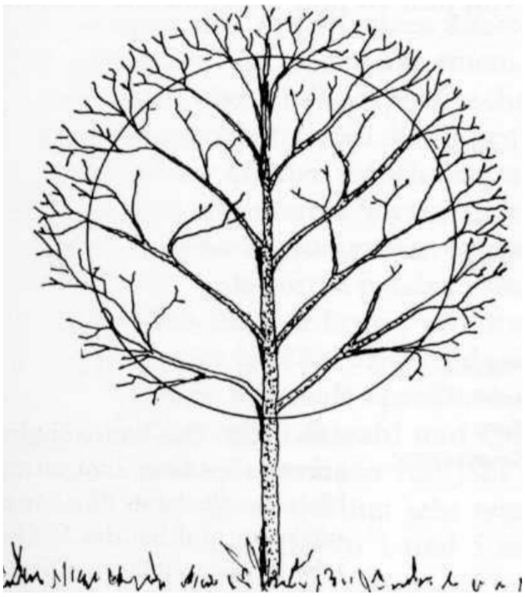
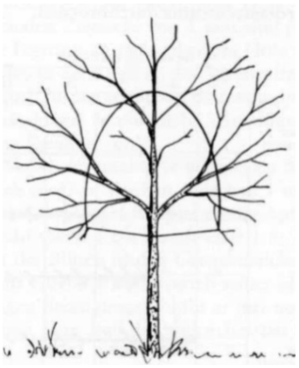
The experience acquired in the management of a slowing of 4,000 apple plants in Salom, Yaracuy state (810masl) with the material 'VC -l' and the cultivars 'Anna' and 'Dorsett Golden', allows us to point out that the apple tree in Venezuela It is a possible crop. However, it must be taken into account that the first thing to do is choose a soil with very good drainage, both internally and externally, not compacted and preferably in sloping areas such as the hills that abound in the country. Then some of the apple materials that are mentioned as “low chilling” should be selected: 'Anna', 'VC -l' and 'Dorsett Golden'. It will be necessary to add a material identified as 'Uzcátegui' in the Andes and the cultivar 'Winter Banana' in Caripe. Although in the medium term no other cultivar should be ruled out for more “high Chilling requirement” has.

CARE OF APPLE TREES (IN TROPICAL REGIONS

EITHERPRUNING IN THE APPLE TREES



Grown Wild at Apple Tree



Grown Commercial at Apple Tree

It is a fruit tree that thrives in all types of deep, healthy soil, in virtually all regions. It lends itself well to pruning, which makes it possible to reduce the volume of its branches. In this way it will find a place in any Garden.

The pruning of the apple tree will always be done in winter, when the leaves have fallen. The first pruning of our apple trees will be done when planting. Between the months of November and March, if the apple tree has three main branches (one-year-old branches), these 25-30 cm are cut with good pruning shears.

If the apple tree is more developed (two-year-old branches), the six upper branches are cut 25-30 cm and the lower ones are pruned above the second bud from the base.

From the fifth year after planting, between November and February, pruning is done to reduce the size of the crown by about a third in order to maintain apple production near the center of the tree. The fruits will themselves be better formed. Forked branches, those that cross, those that are badly located (towards the center of the tree) and suckers are suppressed. If you buy a bare root specimen, you will have to cut the tips a few centimeters.

TABLE OF THE SCOPE OF MATURITY OF APPLE TREES

Grown at Place	Developing Early	Developing Half	Developing Late
In The Temperate	**3/5years**	**8/10years**	**10/15years**
In The Tropics	**5/8years**	**10/15years**	**15/25years**

EITHERNUTRITIONAL DEFICIENCY IN APPLE TREE

		N	P	K	Ca	Mg
Production		73	49	20	138	18
Fe	Media	101	50	33	104	19
	%	38+	2+	65+	25-	6+
Mn	Media	116	35	34	148	32
	%	59+	29-	0	7+	78+
Zn	Media	65	34	60	96	24
	%	11-	31-	20+	30-	33+
Cu	Media	111	63	52	65	9
	%	52+	15+	160+	52-	50-
Ni	Media	62	51	21	136	20
	%	15-	4+	5+	1-	11+

Macronutrient requirements to bring the micronutrient sufficiency range.

However, it is usual to find foliar symptoms of deficiency of this nutrient in apple crops; The absorption of this element by plants can be strongly depressed in the presence of other cations. In alkaline soils the formation of magnesium carbonate and excess calcium, potassium and sodium reduce its availability. Furthermore, magnesium weakly adsorbs to soil colloids, which predisposes it to being lost by leaching, particularly in soils with low organic matter content and low cation exchange capacity. Faced with this situation, foliar applications of various products with magnesium salts are effective in correcting its deficiency.

Apple Blossom Weevil: It feeds exclusively on the flowers of apple trees, the beetle is a weevil that measures between 5 and 6 mm and is very difficult to combat ecologically but we can prevent it starting by planting the Reinette variety as it is less susceptible to its attacks. They can also be put sticky traps on the trunk so they stay stuck or plant varieties that bear fruit earlier than normal as these beetles hibernate and begin their cycle when spring begins.

We can also place straw shelters in containers and capture them directly there. In the past, some stretched tarps were placed under the tree and the tree was shaken, so most of the beetles could fall.

Apple Spider: It is a moth that attacks the entire tree and cadufolious it if it is not fought. The Bacillus is our best ally.

Woolly Apple Aphid: It is one of the most dangerous pests since it is covered with a kind of "wool" that protects it and reproduces easily, in addition to attracting other fungi such as bold due to the sugary liquids they produce.

If the pest is in its infancy, a paraffinic oil and azaridactin treatment can be applied, although its predators are usually more effective if our garden is organic. If we want to have Aphelinus mali, which is its main predator, we must plant some reservoir plants in the garden from the umbelliferous, compound, lipped, leguminous or cruciferous families.

Zeuzera and Cossus: They are moths that lay their eggs in the bark as their caterpillars feed inside the trunks of the apple tree. Its control is difficult but we can extract them manually with a wire if we have few trees. Another more effective method is to place traps with pheromones, ideally 10 traps per hectare. We must eliminate branches that are very affected by pruning and trees that are very sick due to this plague.

Red spider: As everywhere this mite appears when the conditionsof heat and humidity are optimal, so we must combat it as in other crops.

Embroiderers of the Fruits: They are butterflies that in the larval stage cause damage to the fruit such as superficial erosions. It is difficult to fight organically but the treatments must be applied when the tree is flowering.

Apple Worm: They are moths that in their larval stage feed on the developing seeds of apples, which is why they cause a tremendous hole in the apple and rot it from the inside. The best is to fight with pheromones.

Cochineal or San José louse: It is a la Common Apple Psylla: Well, the psylla of the apple tree is very similar to that of the pear tree pilla-typemealybug that can affect the branches or the fruit and can be combated by spraying with paraffinic oil.

fruit fly: either Ceratitis capitation attacks the fruits because its larvae feed on it, it is best to set traps.

Powdery Mildew: It is one of the most common fungi that affect a large number of plants, especially if the conditions are adequate, such as high heat, high humidity and we have wet the leaves when watering.

Scab or Spotted Apple Tree: Causes darks pots on the leaves and fruits. We can apply fungicide treatments as a preventive with horsetail or milk but they are not very effective if the fungus has already spread a lot.

Apple Blight: Causes lesions on the trunk and branches.

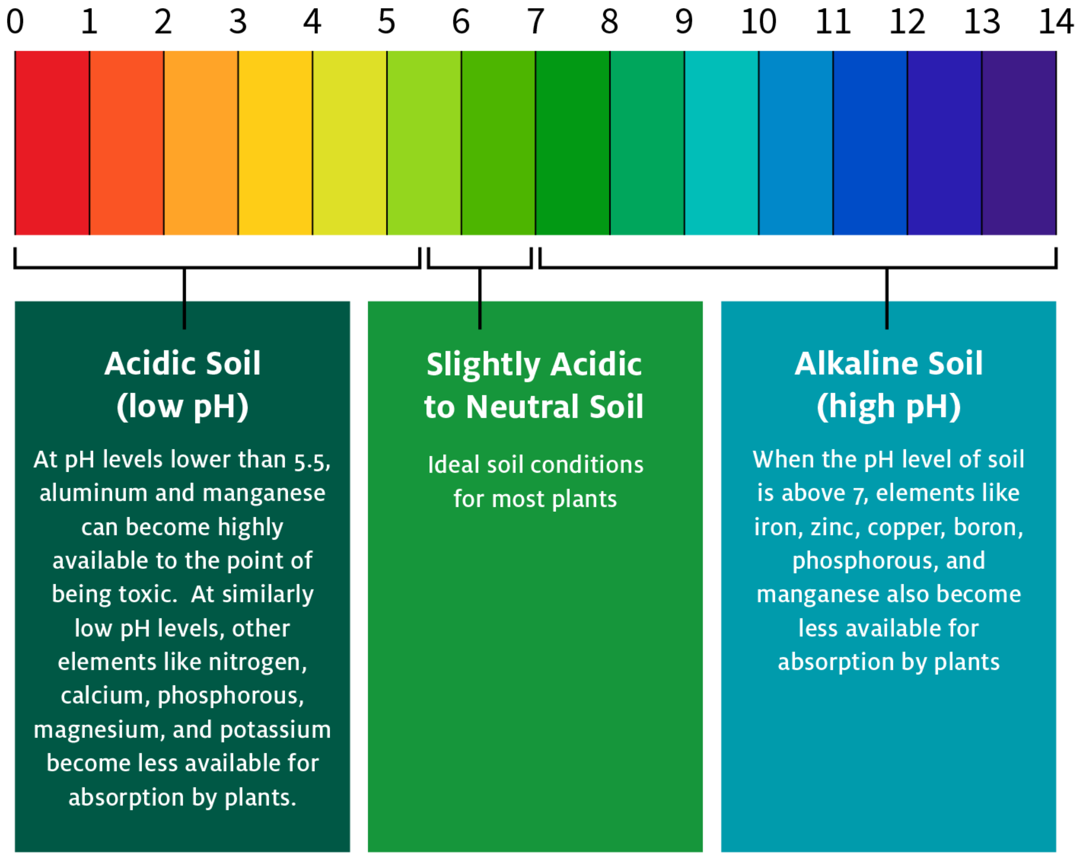
Moniliosis: When there is high atmospheric humidity, characteristic spots like the one we see in the photo can be produced on branches, leaves or fruit. Affected branches

must be removed during pruning, as well as mummified fruits (grey and wrinkled) and even those that have fallen to the ground. Pests that can act as vectors must be controlled.

Rust: Other neighboring trees can transmit it to the apple tree and it appears as orange spots on the leaves or fruit. Luckily it can be fought.

Bacterial Fire: It seems that the leaves and branches have been burned because it has a blackish and decayed appearance. The only remedy is to carefully remove the affected branches and leaves and burn them or throw them away.

TYPES OF SOIL SUITABLE FOR GROWING APPLE TREES



Acidic Soil (low pH)

At pH levels lower than 5.5, aluminum and manganese can become highly available to the point of being toxic. At similarly low pH levels, other elements like nitrogen, calcium, phosphorous, magnesium, and potassium become less available for absorption by plants.

Slightly Acidic to Neutral Soil

Ideal soil conditions for most plants

Alkaline Soil (high pH)

When the pH level of soil is above 7, elements like iron, zinc, copper, boron, phosphorous, and manganese also become less available for absorption by plants

When the "setting" of more than 50% of the flowers occurs, fertilization begins. This must be done according to the nutrient content in the soil and at the right time. If done before flowering, more vegetative growth is stimulated and flowering is reduced. The same happens when excessive amounts are applied. If we observe that the plantation has had excess vegetative growth in previous months, it is preferable not to fertilize.

COMPARATIVE SOILS USEFUL FOR APPLE TREES

Typically Soil of North-Center at Venezuela	Typically Soil of Mediterranean
Alluvial Soil Loamy-Clay Soil	"Terra Rossa" Soil Clayey Soil
It is rich in minerals and nutrients, very fertile and a soil for a good harvest. It often contains gravel, sand, and silt. The chemical composition of the soil will depend on the place where it is located. The topography of the land will influence what runs off into the river which will eventually form the alluvial soil. An example is the volcanic pumice in the western part of the state of Nayarit, Mexico. The region's alluvial soils contain pumice and have physical and chemical properties that provide a good environment for vigorous plant growth.	It is a type of red clayey soil produced by the weathering of the marls and the washing or leaching of the calcium carbonate that this type of rock contains. Compared to most clay soils, terra rossa has surprisingly good drainage characteristics. The combinations of the two rocks with many other minerals, as well as the effect of weathering and erosion produced by humidity and rain, usually breaks down these rocks into their two original components (clay and limestone) that had previously been mixed (in ancient times passes) as sediment carried by rivers.

COLNIZATION OF THE LAND

(λ) It is understood as; a process in biology by which a species spreads successfully to new areas. In Venezuela it is not a very common crop and it is very diffuse and dispersed. So getting good Brood individuals is difficult and in many areas impossible. So it is important to bring individuals accustomed to climatic conditions similar to the area where they will live. For there to be a good colonization, the following parameters must be taken into account:

In Venezuela it is not a very common crop and it is very diffuse and dispersed. So getting good Brood individuals is difficult and in many areas impossible. So it is important to bring individuals accustomed to climatic conditions similar to the area where they will live. For there to be a good colonization, the following parameters must be taken into account:

Pioneers of colonization in the Intermediate area of Guatire

MYCORRHIZA

The symbiosis between a fungus (mycos) and the roots (rhizos) of a plant is defined.

The benefits provided to plants by mycorrhization are numerous. Thanks to it, the plant is able to explore more soil volume than it reaches with its roots, as the hyphae of the fungus join in this work; it also more easily captures certain elements (phosphorus, nitrogen, calcium and potassium) and water from the soil. The protection provided by the fungus also makes the plant more resistant to certain environmental stresses that affect the soil, such as salinity, changes in temperature and the soil acidification derived from the presence of sulfur, magnesium and aluminum. As if all this were not enough, some physiological reactions of the fungus induce the root to remain active for longer than if it were not mycorrhized.

All this results in a greater longevity of the plant: in fact, it has been proven that some trees, such as pines, can live longer than non-mycorrhized pines after having been mycorrhized. In other species, this union is so close that without it the plant cannot survive, as is the case with orchids. Plants whose seeds lack endosperm (reserve food substances) are completely dependent on the fungus for food and subsequent germination.

Root infection by the fungus occurs from propagules present in the soil. They can be spores and pieces of hyphae of the fungus and also already mycorrhized roots. In order to ensure the success of the company, the sowing of most edible or decorative plants and the reforestation that is currently carried out accompany the new plants and shoots with fragments of the most suitable fungus to establish mycorrhizal associations. with each species to be cultivated.

Arbuscular mycorrhiza has received considerable attention in recent years because plants receive various benefits from symbiosis. Protection against root pathogens is a benefit that has been intensively studied in various parts of the world. There are several reviews of mycorrhizal-pathogen interaction that emphasize the potential for biological control of root diseases, however. There are few studies regarding diseases on stems and leaves, but, in general, mycorrhized plants are less susceptible than non-mycorrhized ones.

Regarding the interaction between arbuscular mycorrhiza and pathogenic bacteria, they demonstrated that tomato plants in mycorrhizal association with Glomus mosseae were protected against Pseudomonas syringae; In fruit trees, no investigations have been carried out in relation to this, except that reported by Perrin (1990), of the interaction between mycorrhizal fungi and Pseudomonas syringae in peach, however the effect was null.

Fruit trees are high value crops and their production often involves costly practices such as fumigation, sophisticated fertilization, high labor requirements, specialized equipment, greenhouses, nurseries, etc. One of the most frequent inadequate management factors in fruit orchards is the planting of plants propagated in nurseries with nutritional deficiencies, this is because it is a common practice to fumigate with pesticides to obtain pathogen-free plants. In this way, beneficial fungi are also eliminated, which results in a poor development of the plant, also manifesting chlorosis and dwarfism.

In nurseries it is common to use artificial growth media such as vermiculite, perlite or other materials that do not have mycorrhizal fungi, so it is necessary to introduce them.

Nursery plants without mycorrhizae, when transplanted to permanent or definitive sites, have a high probability of dying, especially in adverse environmental conditions. In addition, in nurseries it is necessary to fertilize abundantly, to partially eliminate deficiency symptoms; in this way the production costs of fruit trees are increased. A reliable alternative in nursery technology is the use of endo-mycorrhiza fungi, which are capable of increasing the growth rate and improving the mineral nutrition of the plant, mainly in poor soils.

The special circumstances of establishing plants under controlled conditions allow the incorporation of mycorrhiza

The special circumstances of establishing plants under controlled conditions allow the incorporation of mycorrhizal technology in these production systems. The increase in growth due to inoculation with endomycorrhizal fungi is desirable for the nurseryman, because it accelerates the cycle of fruit trees. So Productivity is increased with less labor, fertilization and water per plant unit. In addition, mycorrhized plants are usually more vigorous and have a better size, color, etc.; that is why they are of great attraction for fruit growers. The incorporation of mycorrhiza in crop production can be carried out using spores, soil and segments of colonized roots as a source of inoculum.

Many horticultural plants and most fruit and forest trees are first established in nurseries or maintained during the early stages of development in nurseries before being transplanted to the field, so mycorrhizal inoculation can be performed either in the nurseries or in the time of transplantation.

TYPES OF VENEZUELAN APPLE TREES

All the Venezuelan Apple Trees descend from the Israeli Anna Apple Trees and the Wild European Apple Tree, plus some have the genetics of the cross with donors of other varieties of apple trees that are not identified (due to the antiquity of their crossing and the scarce dating of this crop in the country).

Since their massive introduction to the country in the 1970s-1980s (it was the largest Introduction of Apple Trees in Venezuela but it was not the only one), 4-7 generations of crosses have passed, so they can no longer be called by the name of a particular breed and, in general, they are called "Apple Tree Creole", so they have been adapting to their new environment. It should be taken into account that apple trees grown in Venezuela were presented especially for juices more for fresh consumption, but its quality as fresh fruit is not bad, it is just a little more acidic compared to regular edibles.

MAIN APPLE TREES IMPORTED TO THE COUNTRY

WILD APPLE TREE EUROPEAN

They can grow up to 10 meters, it is the most versatile of all the apple trees introduced to Venezuela, their reproduction is sexual. Common to see at 670/800masl. Its features are very generic

ANNA APPLE TREE ISRAELI

They can grow up to the 8 meters, his reproduction is asexual by grafting, layering or stakes. It needs at least 10°C to break floral dormancy. Very common to see him at 800/2500masl. Have the skin color very similar to its relative the Golden Delicious, reddened (50 percent on green or yellow ground color). It flowers and is harvested very early in the season, giving an abundant harvest and it stays fresh for 2 to 3 weeks. It is self-sterile, and is generally cultivated together with the cultivar Dorsett Golden and/or by Ein Shemer, all of which can be grown in warm climates and provide cross-pollination for one another.

EIN SHEMER

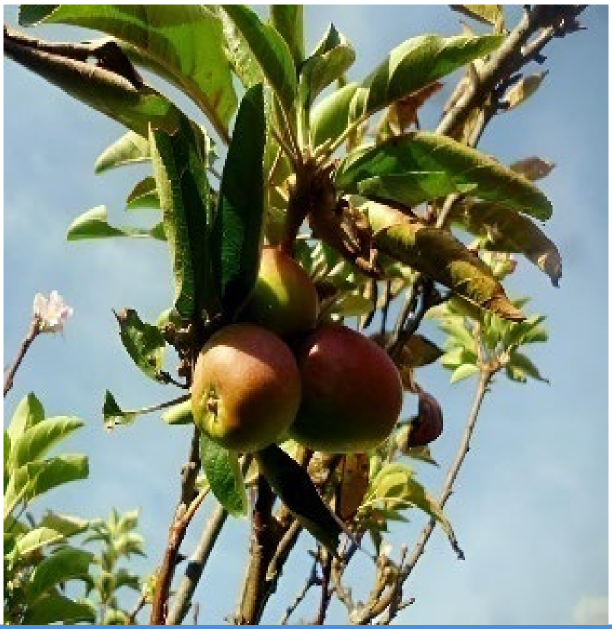
They can grow up to 6 meters, their reproduction is asexual by grafting, layering or stakes. The fruits are very early ripening and do well hot climates. They are medium to large-sized apples with a round-conical shape, which has a similar to that of the 'Golden Delicious' apple. The skin of the 'Ein Shemer' apple has a greenish-yellow hue, which turns yellow-gold when it is mature, and often peaking with red tones, with a red blush on the sun-exposed face. Its interior is creamy white in color with crunchy flesh. It blooms and is harvested very early in season, ready for harvest. Harvest four months after pollination, yielding a bountiful crop, and stays fresh for 2 to 3 weeks.

DORSET GOLDEN

It can grow 6mts, it is adapted to subtropical climates, native to the Bahamas. It is rare to see him in the country. FEATURES

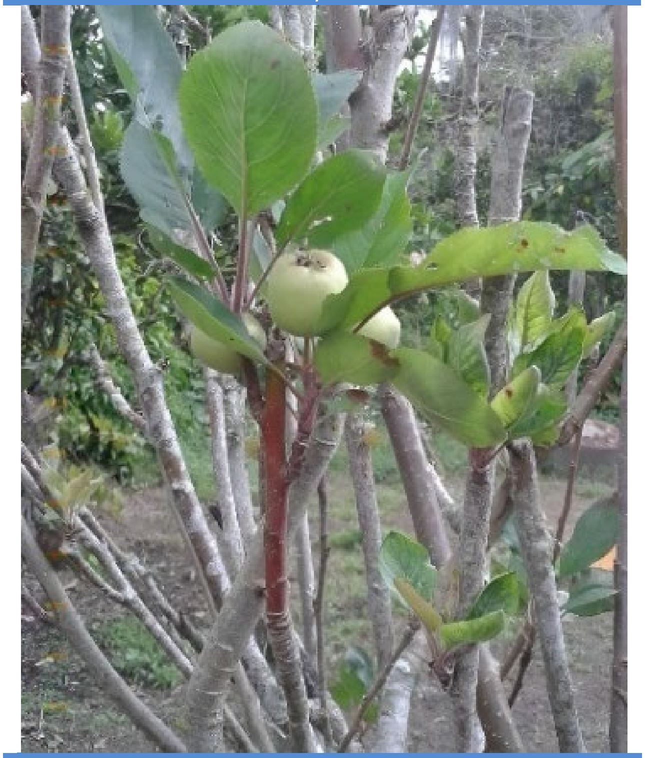
It has a flowering time that begins on May 15 with 10% flowering, by May 19 it has a complete flowering (80%), and by May 24 has 90% petal drop. it has a large fruit size; globose-conical shape, with a height of 74.30mm and a width of 77.03mm; veined, medium weak; medium crown; epidermis with a whitish green ground color, with a red over color, with a low-medium amount of upper color, with a very low striped/mottled color pattern, "resenting" (superficial rough browning that some varieties present); crunchy flesh texture and cream flesh color; the fruits are sweet and have a dry juiciness, with a slight aromatic flavor. Dorset Golden' does best in USDA hardiness zones 5–9. Researchers at the University of Florida had observed that 'Dorset Golden' in subtropical climates was evergreen, although it cannot set fruit adequately without period. of latency. It usually goes dormant in December, making it the best time to prune fruit trees. Ploidism: Diploid Auto sterile, for crops needs a compatible pollinator such as 'Ein Shemer' and or 'Anna'.

APPLE TREES VENEZUELAN



UZCATEGUI APPLE TREE "ANDEAN"
1500masl/2800masl

Originally from the Venezuelan Andean Region: Trujillo, Merida, Táchira, Venezuela Although of Andean origin (brought by the Spanish) according to rumors there are crops in areas that are 450 meters above sea level. Good adaptability to the Andean climate, however it is necessary to give them photoperiods. Propagation Method Grafts, Cuttings and Seeds.



WINTER BANANA
800/1000masl

Originally from Caripe Monagas, Venezuela of oriental origin (Presumably brought by the Spanish). Good adaptability to the humid climate of the East, however it is necessary to give them good care due to humidity. Propagation Method Grafts, Seeds.

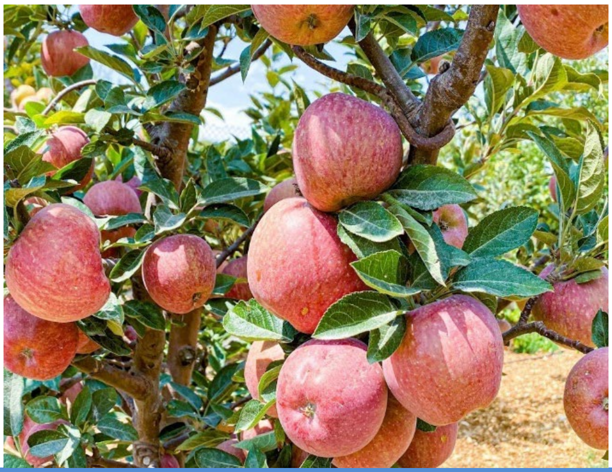
APPLE CREOLE
600/1300masl

Of Coloniero-Mirandese origin (Presumably brought by Europeans living in the area). Little adaptability resistant to Apple Tree Speckles, it is resistant to development in soils slightly porous (ventilated) and not very resistant to humidity. Propagation Methods, Grafts and Seeds.

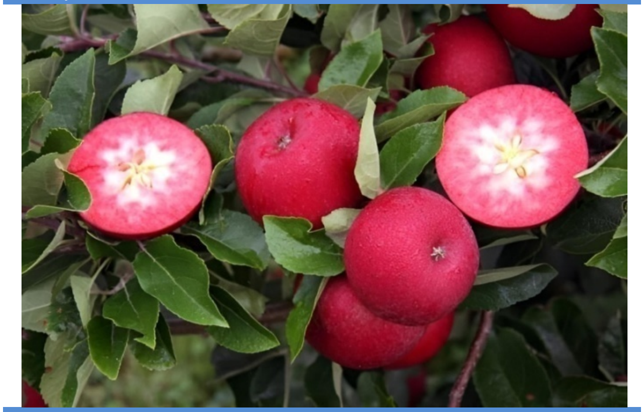
APPLE TREES THAT CAN BE IMPORTAN & PLANTED IN VENEZUELA

APPLE TREE REINETTE BIERZO
1000/1300masl

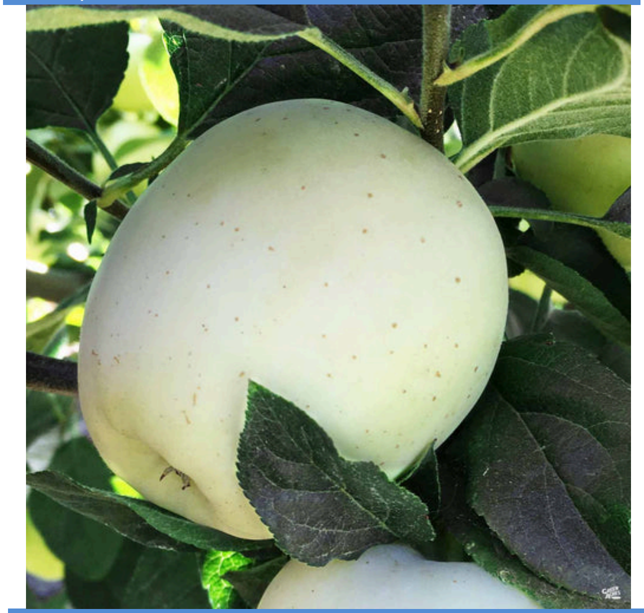
APPLE TREE ROME
600/2800masl



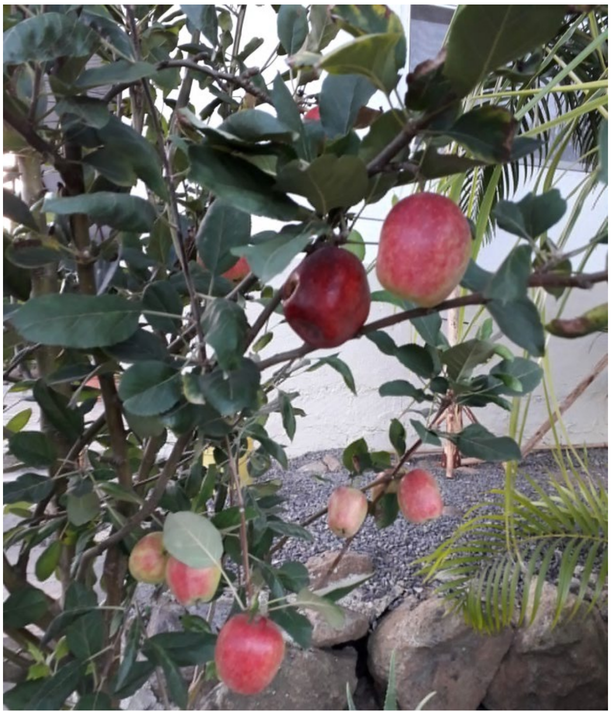
APPLE TREE CHESTNUT CRAB
800/2800masl



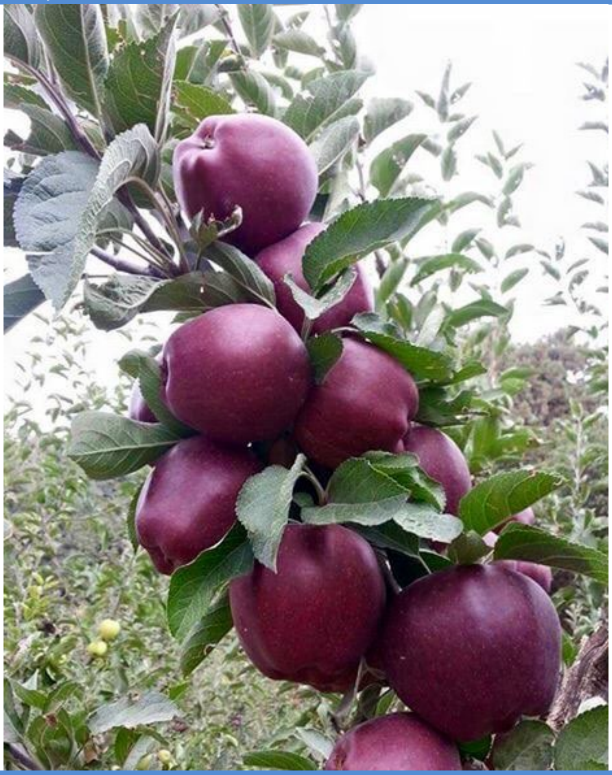
APPLE REDLOVE SWITZERLAND
1000/1600masl



APPLE TREE WHITE WINTER PEARMAIN
1600/2800masl



APPLE TREE GALA RAY
550/800masl



APPLE TREE RED DELICIUOS
850/1200masl

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